CLAIMS

What is claim is:

1. A method for forming a film on a substrate comprising:

activating a gas precursor to deposit a material on the substrate by irradiating the gas precursor with electromagnetic energy at a frequency tuned to an absorption frequency of the gas precursor.

2. The method of claim 1, wherein the method further includes adjusting a source for the electromagnetic energy to provide the electromagnetic energy at a select frequency tuned to a specific absorption frequency of the gas precursor.

3. The method of claim 2, wherein adjusting a source for the electromagnetic energy includes switching laser light from an output of one laser in a laser array to an output of another laser in the laser array.

4. The method of claim 2, wherein adjusting a source for the electromagnetic energy includes switching laser light from an output of one diode laser in a diode laser array to an output of another diode laser in the diode laser array.

5. The method of claim 2, wherein adjusting a source for the electromagnetic energy includes tuning a tunable laser to the select frequency.

6. The method of claim 1, wherein the method further includes controlling a location at which the electromagnetic energy interacts with the gas precursor.

7. The method of claim 6, wherein controlling a location at which the electromagnetic energy interacts with the gas precursor includes rastering the electromagnetic energy across a portion of a surface of the substrate.

8. The method of claim 1, wherein activating a gas precursor includes breaking specific bonds in the gas precursor.

9. The method of claim 1, wherein activating a gas precursor includes decomposing the gas precursor into two of more chemical vapors.

10. The method of claim 1, wherein the method further includes controlling environmental parameters and a location at which the electromagnetic energy irradiates the gas precursor such that activating the gas precursor occurs at a distance from the substrate that is within a mean free path of the activated gas precursor.

11. The method of claim 1, wherein the method is performed as a part of a chemical vapor deposition process.

12. The method of claim 1, wherein the method is performed as a part of an atomic layer deposition process.

13. A method for forming a film on a substrate comprising:

selecting an absorption frequency of a molecule of a gas reactant;

setting a select frequency for a laser source correlated to the absorption frequency;

illuminating the gas reactant using the laser source to deposit a material on the substrate.

14. The method of claim 13, wherein setting a select frequency for a laser source includes selecting a laser in a laser array to provide the laser source having the select frequency.

15. The method of claim 13, wherein setting a select frequency for a laser source includes selecting a diode laser in a diode laser array to provide the laser source having the select frequency.

16. The method of claim 13, wherein setting a select frequency for a laser source includes tuning a tunable laser to the select frequency.

17. The method of claim 13, wherein the method further includes controlling a location at which radiation from the laser source illuminates the gas reactant.

18. The method of claim 17, wherein controlling a location at which radiation from the laser source illuminates the gas reactant includes rastering the laser beam across a portion of a surface of the substrate.

19. The method of claim 13, wherein the method further includes regulating environmental parameters and a location at which the laser source illuminates the gas reactant to activate the gas reactant at a distance from the substrate that is within a mean free path of the activated gas reactant.

20. A method for forming a film on a substrate comprising:

measuring absorption frequencies of one or more molecules of a gas flow;

selecting an absorption frequency at which to activate a gas precursor in the gas flow;

triggering a laser of a laser array, the triggered laser having a frequency corresponding to the selected absorption frequency; and

exposing the gas flow to a laser beam from the triggered laser to deposit a material on the substrate.

21. The method of claim 20, wherein triggering a laser of a laser array includes activating a diode laser in a diode laser array.

22. The method of claim 20, wherein triggering a laser of a laser array includes tuning a tunable laser to the select frequency.

23. The method of claim 20, wherein the method further includes controlling a location at which the gas flow is exposed to the laser beam.

24. The method of claim 23, wherein controlling a location at which the gas precursor is exposed to the laser beam includes rastering the laser beam across a portion of a surface of the substrate.

25. The method of claim 20, wherein the method further includes managing environmental parameters and a location at which the laser beam from the triggered laser illuminates the gas flow to activate the gas precursor at a distance from the substrate that is within a mean free path of the activated gas precursor.

26. A method for forming an electronic device comprising:

providing a substrate;

forming circuits on the substrate, wherein forming the circuits includes depositing a material by irradiating a gas precursor with electromagnetic energy at a frequency tuned to an absorption frequency of the gas precursor to activate the gas precursor.

27. The method of claim 26, wherein the method further includes adjusting a source for the electromagnetic energy to provide the electromagnetic energy at a select frequency tuned to a specific absorption frequency of the gas precursor.

28. The method of claim 27, wherein adjusting a source for the electromagnetic energy includes switching laser light from an output of one laser in a laser array to an output of another laser in the laser array.

29. The method of claim 27, wherein adjusting a source for the electromagnetic energy includes switching laser light from an output of one diode laser in a diode laser array to an output of another diode laser in the diode laser array.

30. The method of claim 27, wherein adjusting a source for the electromagnetic energy includes tuning a tunable laser to the select frequency.

31. The method of claim 26, wherein the method further includes controlling a location at which the electromagnetic energy interacts with the gas precursor.

32. The method of claim 31, wherein controlling a location at which the electromagnetic energy interacts with the gas precursor includes rastering the electromagnetic energy across a portion of a surface of the substrate.

33. The method of claim 26, wherein activating a gas precursor includes breaking specific bonds in the gas precursor.

34. The method of claim 26, wherein activating a gas precursor includes decomposing the gas precursor into two of more chemical vapors.

35. The method of claim 26, wherein the method further includes managing environmental parameters and a location at which the electromagnetic energy irradiates the gas precursor such that activating the gas precursor occurs at a distance from the substrate that is within a mean free path of the activated gas precursor.

36. The method of claim 26, wherein the method is performed as a part of a chemical vapor deposition process.

37. The method of claim 26, wherein the method is performed as a part of an atomic layer deposition process.

38. The method of claim 26, wherein the method further includes forming the electronic device as an integrated circuit.

39. The method of claim 26, wherein the method further includes forming the electronic device as a memory device.

40. A method for forming an electronic system comprising:

providing a processor;

coupling a processor to a memory, wherein at least one of the processor or the memory are formed by a method including depositing a material by illuminating a gas reactant with a laser beam having a frequency targeted to an absorption frequency of the gas reactant to activate the gas precursor.

41. The method of claim 40, wherein the method further includes adjusting the laser beam to a select frequency tuned to a target absorption frequency of the gas precursor.

42. The method of claim 41, wherein adjusting the laser beam to a select frequency includes switching the laser beam from an output of one laser in a laser array to an output of another laser in the laser array.

43. The method of claim 41, wherein adjusting the laser beam to a select frequency includes switching the laser beam from an output of one diode laser in a diode laser array to an output of another diode laser in the diode laser array.

44. The method of claim 41, wherein adjusting the laser beam to a select frequency includes tuning a tunable laser to the select frequency.

45. The method of claim 40, wherein the method further includes controlling a location at which the laser beam interacts with the gas precursor.

46. The method of claim 45, wherein controlling a location at which the laser beam interacts with the gas reactant includes rastering the laser beam across a portion of a surface of the substrate.

47. The method of claim 40, wherein activating a gas reactant includes breaking specific bonds in the gas precursor.

48. The method of claim 40, wherein activating a gas reactant includes decomposing the gas reactant into two of more chemical vapors.

49. The method of claim 40, wherein the method further includes controlling environmental parameters and a location at which the laser beam illuminates the gas reactant such that activating the gas reactant occurs at a distance from the substrate that is within a mean free path of the activated gas precursor.

50. The method of claim 40, wherein the method is performed as a part of a chemical vapor deposition process.

51. The method of claim 40, wherein the method is performed as a part of an atomic layer deposition process.

52. A deposition system comprising:

a reaction chamber;

a source for providing a precursor gas into the reaction chamber;

a means for providing electromagnetic energy to interact with the precursor gas at selected locations in the reaction chamber; and

a means for controlling a frequency of the electromagnetic energy.

53. The deposition system of claim 52, wherein the means for providing electromagnetic energy is configured to provide the electromagnetic energy substantially perpendicular to a flow of the precursor gas into the reaction chamber.

54. The deposition system of claim 52, wherein the means for providing electromagnetic energy is configured to locate a location of interaction of the electromagnetic energy with the precursor gas at a distance from a substrate mounted in the reaction chamber that is within a mean free path of the location of interaction.

55. The deposition system of claim 52, wherein the means for providing electromagnetic energy is configured to raster a location of interaction of the electromagnetic energy with the precursor gas along a surface of a substrate mounted in the reaction chamber.

56. The deposition system of claim 52, wherein the means for providing electromagnetic energy includes an array of lasers.

57. The deposition system of claim 52, wherein the means for providing electromagnetic energy includes an array of diode lasers.

58. The deposition system of claim 52, wherein the means for providing electromagnetic energy includes one or more tunable lasers.

59. The deposition system of claim 52, wherein a means for controlling a frequency of the electromagnetic energy includes a switching circuit to select one of an array of diode lasers to provide the laser beam.

60. The deposition system of claim 52, wherein a means for controlling a frequency of the electromagnetic energy includes circuitry to select an output frequency of a tunable laser.

61. A deposition system comprising:

a reaction chamber;

a source to provide a gas into the reaction chamber;

an array of lasers to provide a laser beam to interact with the gas at selected locations in the reaction chamber; and

a switching circuit to select one or more lasers of the array of laser to provide the laser beam.

62. The deposition system of claim 61, wherein the array of lasers is configured to provide the laser beam substantially perpendicular to a flow of the gas into the reaction chamber.

63. The deposition system of claim 61, wherein the array of lasers is configured to locate a location of interaction of the laser beam with the gas at a distance from a substrate mounted in the reaction chamber that is within a mean free path of the location of interaction.

64. The deposition system of claim 61, wherein the array of lasers is configured to raster a location of interaction of the laser beam with the gas along a surface of a substrate mounted in the reaction chamber.

65. The deposition system of claim 61, wherein the array of lasers is an array of diode lasers.

66. The deposition system of claim 61, wherein the array of lasers includes a tunable laser.

67. An electronic device comprising:

a substrate;

a circuit disposed on the substrate, the circuit formed by a method including depositing a material by irradiating a gas precursor with electromagnetic energy at a frequency tuned to an absorption frequency of the gas precursor to activate the gas precursor.

68. The electronic device of claim 67, wherein the substrate is a semiconductor substrate.

69. The electronic device of claim 67, wherein the substrate is a ceramic substrate.

70. An integrated circuit comprising:

a substrate;

one or more active devices disposed on the substrate, at least one active device formed by a method including depositing a material by illuminating a gas reactant with a laser beam having a frequency targeted to an absorption frequency of the gas reactant to activate the gas precursor.

71. The electronic device of claim 70, wherein the substrate is a semiconductor substrate.

72. The electronic device of claim 70, wherein the substrate is a ceramic substrate.

73. A memory device comprising:

a substrate;

an array of memory cells; and

control circuitry to access and retrieve data from the array of memory cells, the array of memory cells and the control circuitry having a number of active devices, at least one active formed by a method including depositing a material by exposing a gas flow to a laser beam having a frequency correlated to an absorption frequency of a gas precursor in the gas flow to activate the gas precursor.

74. The electronic device of claim 73, wherein the substrate is a semiconductor substrate.

75. The electronic device of claim 73, wherein the substrate is silicon based substrate.

76. A system comprising:

a controller;

a bus; and

a memory device, at least one of the processor, the bus, and the memory device formed by a method including depositing a material on a substrate by irradiating a gas reactant with electromagnetic energy at a frequency tuned to an absorption frequency of the gas precursor to activate the gas precursor.

77. The electronic device of claim 76, wherein the system is an information system.

78. The electronic device of claim 76, wherein the controller is a processor.